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ABSTRACT

This publication is prepared to aid producers in selecting methods of insect population management that have proved effective under Kansas conditions. Topics covered include insect control on alfalfa, soil insects attacking corn, insects attacking above-ground parts of corn, and sorghum, wheat, and soybean insect control. The insecticides effective against each insect are given along with dose and application method information. In addition, a list of generic and trade names are given for some insecticides, as well as a list of poison control centers in Kansas. (BB)

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1977 Kansas Field Crop Insect Control Recommendations

Use Pesticides Safely
FOLLOW THE LABEL

Federal law prohibits the use of any pesticide in any manner inconsistent with its labeling.

SE 024 935

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Due to conditions beyond our control, products mentioned in this publication as "labelled" or "recommended" may not always be locally available. Different formulations of the same chemical often vary in terms of pests and uses listed on the labels. Therefore, when a specific formulation cannot be found locally, you are encouraged to contact your county extension office or Extension Entomology at KSU in Manhattan. Under some circumstances, emergency provisions can be made.

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Managing Insect Populations

Economic control of insects is a vital part of crop production in Kansas. Losses resulting from insects vary greatly from year to year and in different areas of the state. In a recent year insect damage was estimated in excess of $38 million from a few of the major insect pests attacking corn, sorghum, wheat, and alfalfa. Insects such as the sorghum greenbug, alfalfa weevil, and western bean cutworm are examples of relatively new pests that will require greater attention in the future.

Many destructive insects are kept under control much of the time by biotic factors such as weather, parasites, and predators; but when these factors become disrupted or when the pest species gains a slight advantage, an outbreak can occur.

A number of non-chemical methods of control may be utilized in specific instances, but they do not cure all problems. For example, varieties of alfalfa are available which are resistant to pea aphids, spotted alfalfa aphids, and important disease problems. These factors all combined into a single variety are recognized as a major plant breeding achievement. Yet these varieties are still susceptible to alfalfa weevil, grasshoppers, garden webworms, clover leaf weevil, variegated cutworms, and others. The use of cultural practices plays an important role in the control of some insects. Corn following nonrow crops may have infestations of wireworms, cutworms, and grubs. Therefore, where a producer plants continuous corn, he avoids these problems; but then he faces the necessity of rootworm control.

Date of planting is another consideration. Early planted corn is more likely to escape second generation European corn borer, fall armyworm, and have less earworm infestation. However, early planted corn is more susceptible to first generation European corn borer infestation.

When all non-chemical methods of control are considered in depth, there must still be heavy reliance on the proper use of insecticides to control species when outbreaks occur. Otherwise, production of some crops could not exist as we know them in Kansas today.

This publication is prepared to aid producers in selecting methods of insect population management that have proved effective under Kansas conditions. This publication is revised annually and is intended for use during the current calendar year **only**. Previous editions are now void and should be discarded. It is advisable to consult the County Agricultural Agent or the Extension Entomologist before undertaking major insect control because label approval specifications frequently change and new research results become known.

Insecticide Names

Common Chemical or Proprietory Name*	Some Trade Names Used in Kansas
azinphosmethyl	Guthion
carbaryl	Sevin
carbofuran	Furadan
carbophenothion	Trithion
chlordane	Chlordane
demeton	Systox
diazinon	Diazinon
diazinon and methoxychlor	Alfatox
dichlorvos	Vapona, DDVP
dimethoate	Cygon, Defend, Rebelate
dioxathion	Delnav
disulfoton	Di-Syston
endosulfan	Thiodan
endrin	Endrin
EPN	EPN
ethoprop	Mocap
ethyl parathion	Parathion
fensulfothion	Dasanit
fonofos	Dyfonate
heptachlor	Heptachlor
imidan	Imidan, Prolate
lindane	Lindane
malathion	Malathion, Cythion
malathion and methoxychlor	Alfacide
methoxychlor	Methoxychlor
oxydemetonmethyl	Meta-Systox R
methyl parathion	Methyl Parathion Encapsulated Penn Cap M
mevinphos	Phosdrin
naled	Dibrom
phorate	Thimet
phosphamidon	Dimecron
methidathion	Supracide
terbufos	Counter
trichlorfon	Dipterex, Dylox
toxaphene	Toxaphene

*Proprietory names are used where common chemical names have not been designated. Chemicals are usually, locally, known by their trade names.

Read these important considerations.

1. Know the pest you want to control. Ask for help if there are questions.
2. Few treatments other than soil insect control on

corn are effective when applied as a preventative measure when insects are not present at the time of application. The near-pathetic examples where producers apply insecticides "just to feel well" is probably the quickest possible way to obtain justification for cancellation of insecticidal compounds.

3. The importance of timing of control measures cannot be overstressed. One of the primary reasons why insect losses frequently run so high is because the infestation is not detected until damage has reached an advanced stage. Stopping losses before they occur requires systematic scouting of all crop fields at least weekly.

4. Not all insects can be practically controlled; the cost of control may run higher than the loss caused by the pest. Examples are corn earworm in field corn, most corn leaf aphid infestations, brown wheat mite, and low levels of European corn borer.

5. Rates are given in terms of pounds of actual insecticide toxicant per acre. A recommendation calling for 2 pounds of carbaryl per acre would require 2½ pounds of 80 percent Sevin WP per acre; or 4 pounds of 50 percent Sevin WP per acre.

6. Waiting intervals refer to the time that must lapse after the application is made, before the crop may be harvested without encountering illegal residues. The waiting interval applies to either forage or grain use where directions do not otherwise specify. Be sure the restrictions are thoroughly understood before making the application. The waiting interval in no way signifies how long an insecticide will remain active in controlling insects.

Using Insecticides

All insecticides are capable of causing injury to man and animals. Handle them with care and use them only when needed. Follow the directions and heed all precautions on container labels. Store in plainly marked containers away from all food products and in a dry place where children and animals cannot reach them.

When mixing or applying insecticides, avoid spilling them on the skin, and keep them out of the mouth, nose, and eyes. If any is spilled on skin or clothing, immediately wash it off the skin and change clothing. If it gets in the eyes, flush them with plenty of water for 15 minutes and get medical attention.

Wash the face and hands thoroughly after applying any insecticide, and before smoking or eating. After long exposure to insecticide, bathe and change clothing. Wash clothing on which insecticide residues have accumulated before wearing them again.

Mevinphos (Phosdrin), phorate (Thimet), demeton (Systox), disulfoton (Di-Syston), parathion, azinphos-methyl (Guthion), methyl parathion, carbophenothion (Trithion), EPN, and phosphamidon are examples of extremely poisonous insecticides and may be fatal if swallowed, inhaled, or absorbed through the skin. They should be applied only by a person thoroughly familiar with the hazards, who will assume full responsibility for safe use, and who will comply with all precautions on the labels. When applying these materials, wear a respirator of a type that has been tested and found satisfactory by the U.S. Department of Agriculture. A list of acceptable respiratory protective devices may be obtained from the Entomology Research Division, Agricultural Research Service, Beltsville, Md., or from Extension Entomology, Kansas State University.

If the person is taken to a physician or hospital, take the insecticide container label with you. It has valuable information.

Store insecticides where livestock, pets, children, and unauthorized persons cannot gain access to them.

To protect fish and wildlife, do not contaminate streams, lakes, ponds, or marshes. Do not clean spraying equipment or dump excess spray material near such water.

To avoid killing bees, do not apply insecticide to legumes when they are in bloom. If insects must be controlled at this time to save the crop, do this only during hours when the bees are not visiting the plants. Avoid drift of insecticide into bee yards or adjacent crops in bloom. Notify the bee owner before applications are made adjacent to bee yards. Sprays are less harmful to bees than are dusts.

Avoid drift of sprays or dusts to nearby crops or livestock, especially from applications by aircraft or other power equipment. Do not allow poultry, dairy animals, or meat animals to feed on plants or drink water contaminated by drift of insecticide.

Concern over contamination of the environment is ever increasing. One of the many pollutants most frequently accused and condemned is insecticides, particularly the more "persistent" or "hard" insecticides, or "chlorinated hydrocarbons," those which remain in the environment for long periods of time.

Certain root crops such as sugar beets, carrots, and sweet potatoes, when grown subsequently in such soils may contain illegal residues even though the insecticide was not applied to these crops but to the previous crop in rotation.

The mention of commercial products in this publication does not constitute a guarantee or a warranty of the product and does not imply its approval to the exclusion of other products that may also be suitable.

Handout information on specific insect control problems is available in county Extension offices.

Insect Control on Alfalfa

Some pest problems can be avoided by selecting varieties which carry resistance to insect and disease attacks.

Kanza alfalfa is a variety which carries good resistance to pea aphids, spotted alfalfa aphids, and contains some tolerance to leafhoppers. It is also resistant to bacterial wilt and may be less damaged by root rot than some other varieties.

Cody alfalfa is resistant to the spotted alfalfa aphid and bacterial wilt and less severely damaged by leaf diseases but this variety as most others is susceptible to pea aphids.

None of the varieties currently available contains resistance to the alfalfa weevil.

Alfalfa grown in Kansas is often utilized miles from the area of production in the form of hay or dehydrated products. Since it is necessary to avoid using pesticides capable of leaving illegal residues in milk or meat products, these recommendations consist solely of non-persistent insecticides for forage alfalfa production. In certain instances in seed production fields some of the more residual type insecticides may be utilized.

Economic insect infestations are more likely to occur early in the growing season when weather conditions are more variable. Control with most insecticides will be more effective when applied under conditions where daytime temperatures rise above 60° F.

Alfalfa Caterpillar

Infestation occurs all summer. The larvae are dark green worms with a white stripe along each side of their bodies. They are usually controlled by natural enemies. Control measures are justified when there are 10 worms per sweep of a net.

Methoxychlor

1 pound actual toxicant per acre. A 7 day waiting interval is required.

Carbaryl

1 pound actual toxicant per acre. No waiting period.

Alfalfa Weevil

The alfalfa weevil is considered to be a serious threat to the production of alfalfa in all areas of the state.

Adult weevils become active in the fall and enter alfalfa fields to begin laying eggs inside alfalfa stems. Activity ceases during the cold winter, but resumes during the early spring. Fall-laid eggs begin to hatch during March and early April; spring-laid eggs also hatch after being exposed to a few days of warm temperatures. The egg hatches into a small, light green, black-headed worm or larva which has a white stripe down the center of the body. Larvae feed for about three weeks and become about ¼ inch in length at maturity. During this time they cause damage by feeding on the terminal and upper leaves of the plant. If infestations are heavy enough, all foliage may be destroyed and sometimes the stand is damaged beyond recovery. In most fields, infestations arise from both fall- and spring-laid eggs, causing damage to extend over a period of about 6 weeks.

The majority of the damage occurs during the time when the first cutting is being produced, but damage by larvae as well as adults may prevent the regrowth from developing as soon as it should. Newly-emerging adults usually begin to leave the fields sometime after the first cutting has been removed to hibernate during the summer, and do not return until late fall to begin egg-laying again.

CONTROL

In any given area, losses are usually greatest during the first year or two following the initial build-up of weevil populations. Part of this is due to the fact that it takes a year or two before producers become experienced in weevil control. In spite of the weevil, alfalfa can be a profitable crop to grow in Kansas.

Cultural Factors

Any one of several steps can be taken to reduce weevil populations, particularly that segment of the infestation which develops from fall-laid eggs. Fall egg-laying in Kansas appears to occur from mid-October into November; steps can be taken to destroy these eggs during December, January, and February.

Destruction may be accomplished by grazing, burning (where enough old growth remains on the field), flaming, or crushing the stems with a heavy roller. The timing of these practices is important; beginning too early or too late will result in decreased effectiveness. None of these methods is thought to be completely effective because infestations can still develop from spring-laid eggs and may have to be chemically controlled before the first cutting is removed. Long-range effects are also open to question.

When to Use Insecticides

Situation 1: Soon after green-up in the spring, when alfalfa growth ranges from 3 to 7 inches in height, producers should watch especially closely for the first signs of feeding injury in the tops of alfalfa plants. Control measures should not be delayed beyond the point where the top inch of growth is generally showing some feeding damage, or where one can find two or more larvae per terminal. In this situation larval numbers will probably build up again about two weeks after control is applied, especially where short-lasting insecticides are used. Retreatment will be necessary before the first cutting is large enough to remove.

Situation 2: In areas where infestations are light early in the season, weevil damage may become plainly visible as plants range from 8 to about 14 inches in height. Control measures should be applied where skeletonizing is occurring to the top 1 to 2 inches of growth, on about 30 to 50 percent of the plants. During this stage of growth, damage can occur extremely fast; severe loss of foliage can occur within a period of 3 to 4 days where high larval populations are present. In this situation one application may provide protection to the first cutting, but this depends on several factors and chances are good that larval numbers will be high enough at the time the first cutting is removed to necessitate the use of stubble sprays.

Situation 3: Under some conditions, alfalfa may not become heavily infested with weevil larvae until close to the cutting stage. The economic threshold would be higher; that is, plants could stand a higher number of larvae without suffering the serious damage evident in earlier growth stages, but higher populations may occur which prevent plants from making additional growth. Therefore, if alfalfa is within three weeks of cutting, it may be advisable to cut early rather than spray. Spraying would be advisable if the top 2 to 3 inches are being injured on the majority of the plants, and if, for some reason, harvest of the first cutting has to be postponed for several days. Consistent early cutting can result in slow regrowth if alfalfa is not in a vigorous growing condition when cut. Follow agronomic recommendations in regard to early cutting.

Management of Regrowth Following First Cutting

Where high larval populations are present at the time of the first cutting, or where large numbers of new adults are emerging, a stubble spray may be necessary to prevent delay in the new growth. Larvae destroy foliage and new buds; adults may also girdle stems to the point where regrowth has to come from underground. If a spray treatment was used within 2 weeks of the first cutting, it should reduce the need for stubble treatment. If a spray treatment was not applied during this period, and if large numbers of larvae or adults were present at the time the first cutting was removed, a stubble treatment will probably be needed just as soon as the first cutting is taken off. This would be especially advisable if cloudy conditions and mild temperatures prevail and if larval numbers appear to remain abundant under the hay in the windrow.

The Importance of Gallonage

Proper spray gallonage is a vital aspect of weevil control. In ground equipment where alfalfa is less than 7 inches in height, 10 to 12 gallons of water per acre is probably sufficient. On 8- to 15-inch alfalfa, gallonage should be increased to 15 to 20 gallons, and probably not less than 20 gallons should be used on alfalfa that is above 15 inches in height. Density of stand must also be considered. A very dense stand may require twice as much gallonage as a poor one. Consult label recommendations for the product used. Rates suggested for different materials vary. Pressure should be maintained fairly close to 30 pounds psi. If at this pressure, you cannot obtain the desired gallonage, larger nozzles will usually be needed but reducing speed also increases total output. Control of alfalfa weevil by aerial application is often frustrating because of the relatively small size of the fields and problems encountered in obtaining sufficient gallonage. Studies have shown that where gallonage was increased from 1 to 4 gallons per acre the initial degree of control did not change greatly, but the residual performance after 2 weeks averaged 15 to 20 percent better for each gallon of additional water that was used up to 4 gallons total. Four gallons was the upper limit of the study.

Azinphosmethyl

¾ pound actual per acre provides about 2 weeks protection against larval damage. Quite high in toxicity, it should be used only by those willing to assume all safety precautions on the label. Do not apply within 21 days of cutting or make more than one application per cutting.

*Methyl Parathion**

½ pound per acre provides up to 10 days protection against larval damage. High in toxicity, it should be used only by those who are willing to assume all safety precautions on the label. Do not apply within 15 days of cutting.

Penn Cap M—(encapsulated methyl parathion)

½ pound actual per acre provides apparently the same degree of control as methyl parathion, but is less hazardous to use in ground equipment. Do not apply within 15 days of cutting.

Malathion

1¼ pounds actual per acre provides 3 to 7 days protection against larval damage. It is more likely to require two applications if a long period of residual protection is needed. Low in toxicity. No waiting interval required.

*Imidan**

1 pound actual per acre provides 12 to 14 days protection against larval damage. Low in toxicity. Do not apply within 7 days of harvest. Only one application per cutting.

Malathion-Methoxychlor

1 pound actual malathion plus 1 pound actual methoxychlor per acre provides 12 to 14 days protection against larval damage. Low in toxicity. Do not use within 7 days of harvest.

Methidathion

½ pound actual per acre provides 14 to 21 days protection against larval damage. Quite high in toxicity. Should be used only by those who are willing to assume all safety precautions on the label. Do not apply within 10 days of harvest.

*Carbofuran**

¼ to ½ pound actual per acre provides 14 to 21 days protection against larval damage; 1 pound may provide protection for 21 days or longer. For adult control, use ½ to 1 pound rates; apply only to pure stands. Do not apply within 7 days of cutting at ¼ pound rate; do not apply within 14 days at rates between ¼ and ½ pound. Do not apply within 28 days at rates between ½ and 1 pound. Apply only one application per season (not per cutting). Quite high in toxicity. Should be used only by those willing to assume all safety precautions on the label.

Diazinon-Methoxychlor

¾ pound of diazinon plus 1½ pounds methoxychlor, or use 3 quarts of a commercial mixture of 10 percent diazinon and 20 percent methoxychlor to provide 10 to 12 days protection against larval damage. Low in toxicity. Do not apply within 7 days of harvest.

The length of control statements for the above listed materials imply the approximate maximum length of time that one can expect larval numbers to be suppressed under normal conditions. Growers should consider intensity of weevil infestations, length of time control is expected to be needed, safety, cost, and local availability of materials.

*These insecticides are most effective for adult control.

Army Cutworm

Damage occurs in early spring—March, April, and May. It destroys small plants and prevents early foliage. First cutting of older alfalfa may be reduced. A few worms may destroy small plants.

No highly effective insecticide is available but better results will be obtained if infestation is detected early before foliage is destroyed. Try to apply controls on warm afternoons when larvae are above ground feeding.

Trichlorfon

1 pound actual per acre. No waiting interval. Up to 3 applications per cutting permitted.

Parathion (ethyl)

0.8 pound actual per acre. Do not apply within 15 days of harvest.

Blister Beetle

Damage occurs in midsummer. A great number of beetles may feed in local areas of fields and destroy blossoms and leaves.

Methoxychlor

2 pounds actual toxicant per acre. A 7 day waiting interval is required.

Methyl Parathion

½ pound actual toxicant per acre. A 15 day waiting interval is required.

Clover Leaf Weevil

Damage may occur during April and May. Larvae are green with a white stripe down the middle of the back. The larvae head capsule is brown whereas alfalfa weevil larvae have black head capsules. Larvae are approximately ½ inch long at maturity. Feeding occurs mostly at night. A fungus disease usually keeps the population under control. Diseased grubs turn yellow and die. Control measures for clover leaf weevil are justified when infestations average 5 or more healthy grubs per crown.

Malathion

1½ pounds actual toxicant per acre. No waiting period.

Methoxychlor

1½ pounds actual toxicant per acre. A 7 day waiting period is required.

Clover Seed Chalcid

Damage occurs during June, July, and August. Tiny insects destroy seed and emerge from small holes. No satisfactory chemical control.

Garden Webworm

Slender greenish black spotted larvae. At maturity they are greenish to nearly black with a light stripe running down the middle of the back and with three dark spots on the side of each segment, from which projects one to three bristlelike hairs.

On forage alfalfa, mowing is recommended if the infested crop is near the cutting stage. The webworms will usually disappear before the new crop comes in.

If the crop is more than 2 weeks from cutting and heavily infested, one of the following sprays should be used in sufficient gallonage and pressure to obtain thorough coverage of foliage and penetration of the webbing.

Methoxychlor

2 pounds actual per acre. Do not use within 7 days of harvest.

Methyl Parathion

¼ to ½ pound actual per acre. Do not use within 15 days of harvest.

Carbaryl

1 to 1½ pounds actual per acre. No preharvest waiting interval.

Trichlorfon

¼ to 1 pound actual per acre. Three applications per cutting permitted. No preharvest waiting interval.

Toxaphene

1½ pounds actual per acre. (Use only on alfalfa for seed production.)

Grasshopper

Grasshopper damage may occur any time from May to frost. Infestations injure alfalfa by destroying the foliage. For control, apply chemicals in young stands under 6 inches in height and to protect the regrowth following cutting. Applications may need to be repeated since allowable insecticides have short residual properties.

Malathion

1 pound actual toxicant per acre. No waiting period.

Diazinon

½ pound actual toxicant per acre. No waiting period for grazing; a 7 day waiting period for cutting.

Carbaryl

¾ to 1 pound actual toxicant per acre. No waiting period.

Carbofuran

1/8 to ¼ pound actual per acre. Do not apply within 7 days of grazing or cutting.

Malathion (ULV)

½ pound actual toxicant per acre. No waiting interval.

Fall Armyworm

Infestations are most likely to occur in late summer to early fall before frost (September-October). One to two worms per square foot may destroy seedling alfalfa, and populations of 10-15 per square foot have been observed to destroy 12-14" alfalfa.

Carbaryl

1½ pounds actual per acre. Sevin 80S and Sevin 50W approved for use by special state label. No preharvest waiting interval.

Ethyl Parathion

¾ pounds actual. 15 day waiting interval before harvest of treated foliage.

Leafhopper

Damage occurs during midsummer. They are small jumping and flying insects. A few are always present. Control is not needed unless leafhoppers are extremely abundant and yellowing of foliage begins.

Resistant varieties: The variety "Kanza" contains some leafhopper resistance and is suggested for use in establishing new plantings.

Methoxychlor

1 pound actual toxicant per acre. A 7 day waiting period.

Malathion

1 pound actual toxicant per acre. No waiting period.

Diazinon

½ pound actual toxicant per acre. No waiting period for grazing or feeding; 7 day waiting period to cut for hay.

Pea Aphid

Damage occurs during March, April, and May. Heavily infested plants turn yellow and wilt. These large green aphids feed only on legumes. Keep fields under close surveillance early in the season during periods of slow growth.

Resistant varieties: The variety "Kanza" contains resistance to pea aphid attack and is recommended for use in establishing new plantings.

Malathion

1 pound actual per acre. No preharvest waiting interval required.

Methyl Parathion

¼ pound actual per acre. Do not apply within 15 days of harvest.

Diazinon

½ pound actual per acre. Do not apply within 7 days of harvest. No waiting period for grazing of feeding.

Dimethoate

¼ to ½ pound actual per acre. Do not apply within 10 days of harvest. One application per cutting. Do not apply during the bloom periods.

Spotted Alfalfa Aphid

Tiny yellow aphids on the underside of leaves cause death of leaves. More than one aphid per seedling may severely damage susceptible varieties. Apply chemicals when two to three aphids per seedling plant are present. In ground machine, use at least 12 gallons of water at a temperature above 65° F. See control under seed production for use of granules.

Resistant varieties: "Kanza" and "Cody" contain spotted alfalfa aphid resistance and are suggested in establishing new plantings.

Sprays: Use sprays listed for pea aphid control.

Granules: Suggested for use when planting spotted alfalfa aphid susceptible varieties. Granules listed below may be applied with the seed or drilled, sidedressed, or broadcast at the time of planting.

Disulfoton

6.7 pounds of 15 percent granules. No restrictions on use of alfalfa forage when harvested at normal stage of growth. Do not use Di-Syston L.C. on alfalfa forage.

Variegated Cutworm

The worms have four or five white dots, one per segment, down the center of the back. The name cutworm can be misleading since they feed upon the foliar parts of the plants. Damage is caused by the worms feeding on the new growth following the first cutting and heavily infested fields fail to green up. Control when an average of more than 2 or 3 worms per square yard are present immediately after the first crop of hay has been removed.

Trichlorfon

1 pound actual per acre. Three applications per cutting permitted. No preharvest waiting interval.

Carbaryl

1⅓ pounds actual per acre. No preharvest waiting interval.

Methyl Parathion

1 pound actual per acre. Do not use within 15 days of cutting.

Soil Insects Attacking Corn

Corn Rootworm (Western and Northern)

Fields which have been continuously in corn in most areas will need a planting-time band application for rootworm control.

Planting time applications: Use one of the materials listed below on continuous corn land where rootworm problems are known to occur. Only granular materials are recommended in Kansas. Placement of the insecticide is very important. Granules should be applied in a 5- to 7-inch band in front of the press wheel. The idea is to just lightly incorporate the granules in the top 1 inch of soil. If the insecticide is placed deeper, as would be the case where the granules are being applied in front of the covering disk or with the seed, poorer control will often result.

Category I	Pounds actual per acre	Pounds product per acre	
		40-inch rows	30-inch rows
Carbofuran 10G (Furadan)	1	10 lbs.	12½ lbs.
Terbufos 15G (Counter)	1	6⅔ lbs.	9 lbs.
Category II			
Fonofos 20G (Dyfonate)	1	5 lbs.	6½ lbs.
Fensulfothion 15G (Dasanit)	1	6⅔ lbs.	9 lbs.
Category III			
Phorate 15G (Thimet)	1	6⅔ lbs.	9 lbs.
Ethoprop 10G (Mocap)	1	10 lbs.	9 lbs.

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Compounds in Category I have generally provided the best degree of rootworm control and are considered to be the most reliable in fields where heavy damage occurs.

Compounds in Category II usually perform better than compounds in Category III, but may be less effective than Category I materials. They may be useful for insecticide rotations, particularly in fields where the rootworm problem has not been severe.

Compounds in Category III sometimes perform well, but poor control has been observed more frequently in research tests under heavy rootworm pressure. Use of the products in planting-time applications should be measured against history of problems in the fields under consideration, as well as date of planting. These products are generally believed to be more reliable in later-planted cornfields. It should be noted that these compounds perform very well in post-planting application tests where conditions are satisfactory for control by this method.

Research studies indicate that it is becoming increasingly difficult to obtain effective control of rootworms in planting-time applications with all products. These studies lead us to the conclusion that control of rootworms will be a bigger consideration in corn production in the next few years than it has been over the past decade. All producers should keep the following points in mind in making rootworm control decisions.

1. The rootworm problem occurs in fields planted to continuous corn.
2. The potential for rootworm damage exists in all areas of the state, but is perhaps less of a problem in southeast Kansas south of US 54.
3. Rootworms can develop in almost all soil types, but may be less intense in sandy soils, such as the sandy-land regions south of the Arkansas river.
4. Be very careful not to skimp on rates. Watch placement and application very closely; a uniform 6-7 inch band is a necessity.
5. If one product has been used two or more years, a different choice may be in order this season.

Post planting applications: Research in Kansas indicates that applications at planting time are more reliable than applications made after plants have emerged (June 1-14) unless excellent soil moisture conditions exist. If post planting is elected, use granular Mocap, phorate, diazinon, dasanit, or dyfonate at the rate of 1 pound of actual or ¾ pound of Carbofuran per acre, based on 40-inch rows. Granular applicators may be mounted separately or on cultivation equipment so that the granules are applied in a 7-inch band centered over the planted row. Follow with a cultivator so that some soil is thrown over the granules.

Rootworm control by crop rotation: Rotation is still a very effective method to prevent rootworm infestation. The majority of the adult beetles deposit their eggs in corn fields. Where another crop such as soybeans or milo is substituted the following year, infestations will not materialize since the larvae only survive on corn roots. By the second year it is usually safe to follow with corn with minimum chances of rootworm damage.

Cutworm

Damage by black cutworms occurs on seedling plants, but plants up to 12 inches high may be attacked. The black cutworm is more likely to occur in wet, poorly drained, grassy fields. Infestations are generally confined to eastern areas of the state.

Emergency treatment at time of damage: Control attempts when the majority of the cutworms are ¾ to one inch or more in length usually give poor results. Control of larvae smaller than this stands a fair chance with one of the chemicals below. The alternative is to wait at least two weeks to give worms a chance to mature, then replant as necessary.

Toxaphene

3 pounds actual per acre. Do not feed treated forage to dairy animals or animals being finished for slaughter.

Carbaryl

Use of 20 to 30 pounds per acre of a 5 percent commercially prepared Sevin bait on apple pomace carrier has shown promising results in some regions.

Trichlorfon (Dylox)

1 pound actual per acre. 20 pounds of 5 percent Dylox commercially prepared bait per acre. Do not use corn grain or ensilage within 28 days of treatment.

Where the stand has been reduced to the point that replanting is necessary, apply heptachlor* at 2 pounds actual per acre in a broadcast application and incorporate immediately into the soil.

Maize Billbug

Damage occurs early in the growing season usually in low lands near creeks. The adult billbugs destroy the growing point in the stalks just below or above the soil surface. The larva is a white robust legless grub which tunnels in the lower stem and roots. Infested plants become twisted and distorted. Injury has been rare in recent years.

Control—Apply **toxaphene** as discussed under emergency treatment for cutworms.

Seed Corn Beetle and Seed Corn Maggot

These insects are more bothersome in heavy soils during cool springs. Routine seed treatment is effective and economical. The slender seed corn beetle, a troublesome species in part of Iowa and Illinois, has not been of economic significance in Kansas.

Seed Treatment—**heptachlor** or **lindane**. Follow manufacturer's directions. Do not use treated seed for food or feed.

Wireworm and White Grub

Wireworms are hard, smooth, cylindrical, yellowish worms. They eat into the germinating seed or burrow into the underground part of the stem. Several species occur in Kansas. It requires several years for some species to complete their life cycle. A dozen species of white grubs have been recorded in corn fields in Kansas. The damage they cause is not usually serious.

These insects are not of major importance where continuous corn is grown or where corn follows other row crops. Where corn follows sod, protection against wireworms and grubs should be considered. The following materials applied as a band application, as used for rootworm control, at planting should provide some protection:

	Actual/acre 40-inch rows
Phorate	1 pound
Carbofuran	1 pound
Ethprop	1 pound
Fensulfothion	1 pound
Fonofos	1 pound

Insects Attacking Above-Ground Parts of Corn

Chinch Bug

Bugs congregate near the base of plants and suck sap. They normally migrate into corn from adjacent small grain fields. At this stage they do not have functional wings and migration is on the ground. Barrier sprays should be initiated as soon as migration is detected. Field sprays may be needed if bugs are attacking the corn plants when first detected. Early corn is usually large enough to withstand a great deal of chinch bug infestation.

Barrier Sprays

*Endrin**

¼ pound actual toxicant per acre. Apply as a barrier 2 to 4 rods wide between small grain and corn fields. Small grain fields may be sprayed after harvest or 45 days prior to harvest. Do not feed treated material or graze animals in treated fields. Do not use on corn.

Infested field sprays: Use drop nozzles and direct spray to base of plants. Use 20 gallons of water per acre.

Carbaryl

As used for control if infestations in corn fields in recent years is not listed on labels of locally available formulations.

Toxaphene

2 pounds actual toxicant per acre. Do not feed forage treated with toxaphene to dairy animals or meat animals being finished for slaughter.

Corn Earworm

Damage occurs from June through frost. It causes "ragworm" injury to leaves where plants are infested in whorl stage. On sweet corn, see GARDEN PEST CONTROL leaflet. Field corn has no practical chemical control. Several applications are necessary to measurably reduce earworm damage.

Corn Flea Beetle

Very small shiny, jumping beetles that strip the upper surface from seedling corn leaves. Injury is worse during periods of slow growing conditions.

Control is recommended when fields in 2 to 4 leaf stage are infested with an average of 4 to 5 beetles per plant. Lower boom to direct spray just over the tops of seedling plants.

(Carefully assess amount of injury before applying control measures. In most cases, injury is not serious enough to warrant chemical treatment.)

Carbaryl

1½ pounds actual per acre. No preharvest waiting interval.

Diazinon

½ pound actual per acre. No preharvest waiting interval.

*Use pattern currently under review by EPA. Producers must check legal status of endrin during the 1977 season.

Corn Leaf Aphid

Damage occurs in midsummer. Aphids inside the leaf sheath congregate in the whorls and on tassels. Chemical control is not recommended.

Corn Rootworm Adult Beetle

Damage occurs at silking time. Beetles clip silks before corn is pollinated. Apply foliar spray treatment when there are 8 to 10 beetles per plant, when 10 percent of the silks are beginning to show.

Malathion

1 pound actual per acre. 5 day waiting interval.

Diazinon

½ pound actual per acre. 2 day waiting interval.

Carbaryl

1 pound actual per acre. No waiting interval.

Parathion, Methyl, or Ethyl

¼ pound actual per acre. 12 day waiting interval.

EPN (R)

¼ pound actual per acre. 14 day waiting interval.

European Corn Borer

Damage from the first generation develops in mid to late June and is likely to be more severe in early planted corn. Control is justified when 50 to 75 percent of the plants show feeding injury in the whorl stage. Treat 7 days later if signs of feeding continue. The second generation occurs in August and is usually more damaging in late-planted corn. Damage per borer is less in the second brood but heavier populations may develop, causing stalk breakage and ear droppage. Timing control measures for second brood is extremely difficult. If treatment is used, it should be initiated when corn is in green silk stage in fields where egg masses are present on the underside of the upper leaves. The second brood larvae where present around the leaf sheath of the upper leaves are susceptible to control for 5 to 7 days before they enter the stalks. Two applications will often be needed to obtain satisfactory control.

Control—Several commercial hybrids carry some degree of resistance to first generation borers but this may not carry through to the second generation. Stalk shredding followed by clean plowing will aid in reducing the number of overwintering larvae, but does not necessarily protect the crop the following year.

Granules perform better than sprays. Where sprays are used on the first generation, direct spray into the whorls using high gallonage and pressure. For second generation, direct spray toward the ear zone and to the tassels.

Carbaryl

1¼ pounds actual per acre. 30 pounds of 5 percent, or 15 pounds of 10 percent or 7½ pounds of 20 percent granules; or 1½ pounds actual per acre as spray. No waiting interval.

EPN (R)

½ pound actual per acre. 10 pounds of 4 percent granules or ½ pound actual per acre as spray. Do not use within 14 days of harvest.

Toxaphene

2 pounds actual per acre. 20 pounds of 10 percent granules. Do not ensile treated corn. Do not graze dairy animals on treated stover nor meat animals within 4 weeks of slaughter.

Diazinon

1 pound actual per acre. 7 pounds of 14 percent granules. May be picked immediately but cannot be fed to livestock within 10 days. For control of infestations in the whorls.

Fonofos

1 pound actual per acre in 30- to 40-inch rows. Use 5 pounds of 20 percent granules. Preferable to apply as a band application over the row, but may be applied broadcast. For control of infestations in the whorls, do not apply within 45 days of harvest for feed or graze livestock with 45 days of treatment.

Carbofuran

1 pound actual per acre. Use 10 pounds of 10 percent granules. Preferable to apply by band application over the row, but may be applied broadcast. Do not make application if this product was used in excess of 10 pounds per acre based on 40-inch rows at planting time. Do not make more than two foliar applications per season.

Phorate

1 pound actual per acre. Use 6⅔ pounds of 15 percent granules per acre on 40-inch rows or 9 pounds on 30-inch rows. Apply granules into the whorl prior to tassel emergence. Do not graze or cut for forage within 30 days of treatment. Do not make more than one application per season.

Fall Armyworm

Damage occurs at midsummer. Larvae cut large holes in leaves in whorl stage. Later, may cut large holes in stalks at the nodes. Control on whorl stage not practical unless 75 percent of the plants are infested. Ear droppage in western Kansas is usually due to fall armyworm infestation in the shanks. On silking corn, control may be justified if small larvae are detected before

they have tunneled into the shanks and ears. Direct spray toward the ear zone.

Diazinon

1 pound actual per acre. 7 pounds of 14 percent granules. May be picked immediately but cannot be fed to livestock within 10 days. For control of infestations in the whorls.

Carbaryl

2 pounds actual per acre. No preharvest waiting interval.

Parathion

¼ pound actual per acre. 12 day waiting interval.

Mevinphos

½ pound actual per acre. 1 day waiting interval.

Garden Webworm

Damage occurs in early summer. Slender worms skeletonize leaves on plants less than 18 inches high. Watch fields closely. Damage can be severe if heavy infestation occurs.

Toxaphene

2 pounds actual per acre. Do not feed toxaphene-treated forage to dairy animals or beef being finished for slaughter.

Carbaryl

1 pound actual per acre. No waiting interval.

Grasshopper

Damage occurs all summer.

Field Margins: Spray margins early in the season when grasshoppers are small and before they move to the field. This greatly reduces the area which must be sprayed and the amount of insecticide per land unit area.

Toxaphene

1½ pounds actual per acre.

Infested field sprays:

Carbaryl (Sevin)

½ to 1 pound actual per acre. No waiting interval.

Malathion

1 pound actual toxicant per acre. 5 day waiting interval.

Malathion

8 ounces as ULV. 5 day waiting interval.

Toxaphene

1½ pounds actual per acre. Do not feed forage including ensilage to dairy animals or beef animals being finished for slaughter.

Diazinon

½ pound actual per acre. No waiting interval.

Southwestern Corn Borer

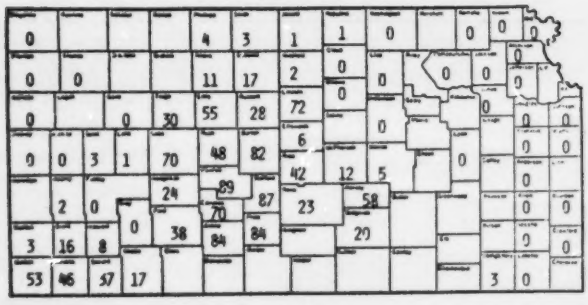
First generation infestations begin in late June and are caused by dark-spotted white worms that feed for five to ten days on leaf tissue in the plant whorl, then move downward to begin tunneling within the stalk. Such tunneling can extend far enough downward to kill the growing point on small plants (dead heart), though the dead heart injury is usually not caused on plants greater than 30 inches in height. While yield reduction can occur from damage caused by first generation larvae, it is not generally assumed to be serious unless the majority of the plants are infested and each of the infested plants contains several larvae. First generation infestations have generally been light in most fields in Kansas in recent years.

The second and most damaging generation occurs in August. Adult moths begin emerging and laying eggs starting around July 15 to July 23 with egg laying reaching a peak somewhere between August 1-15. The exact time of the beginning and peak of egg laying is influenced by season and geographic location. Eggs are deposited on leaves primarily in the ear region. Newly hatched larvae begin feeding on leaves, but prefer to feed on ear shoots, husks, and silks. Within ten to twelve days or even less, this generation also begins tunneling within the stalk, generally below the ear zone.

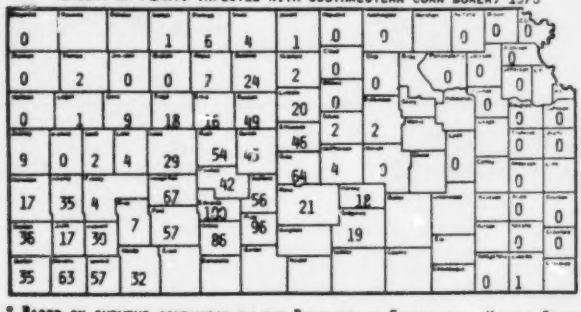
By mid-September the majority of the larvae are full grown. By this time they have tunneled down to the base of the stalk beneath the soil line to begin to prepare for hibernation. By now some of the larvae are beginning to lose their dark spots and will be recognizable only as large white larvae. In final preparation for overwintering, many of the larvae crawl back up the inside of the stalk and select a point about four inches above the soil line at which they chew away an area around the inside of the stalk, leaving only the exterior shell intact. The girdled plants soon begin to break and fall over and frequently contribute to extensive harvest losses.

This insect ordinarily overwinters successfully only in the sandyland region in south central and extreme southwest Kansas. Heavy midsummer infestations moved out of this area into adjacent counties in the summer of 1974 and to a greater degree in the summer of 1975 and 1976. The maps below summarize the infestations for the last two years. While some increase in distribution is noted in 1976, this was less pronounced than it had been during the 1975 season. Noticable first

* Percent of plants infested with southwestern corn borer, 1975



* Percent of plants infested with southwestern corn borer, 1976



* Based on surveys conducted by the Division of Entomology, Kansas State Board of Agriculture.

generation activity was more apt to be more pronounced in the sandy regions of the southern portions of the state. Particularly, tillage practices to expose the stubble during the winter are not practiced. Second generation activity would be expected not only in those fields that experienced noticable first generation infestation, but also in other surrounding fields. This is because emerging moths that produce the second generation are capable of flying for miles in search of attractive corn in which to deposit eggs. Thus, second generation damage can be severe in fields where first generation activity was negligible or even absent.

Control

A few insecticides are labelled for control of southwestern corn borer on corn and these have been evaluated over the past two years in Kansas studies. However, none have performed well enough to warrant recommendation under the methods currently employed for their use. A few newer experimental compounds in the early stages of evaluation hold considerable potential for southwestern corn borer control and the search for a corn plant carrying genetic resistance offers hope for the future.

For the present, growers in infested areas can reduce losses by use of special management practices. These include:

1. Harvesting earlier before girdling begins. (The amount of girdling usually increases rapidly after mid-September). In order to harvest early one should consider the following options. (a) plant early; (b) give consideration to use of a good-producing, short-season variety; (c) consider production of silage corn; (d) use of high-moisture harvest.
2. Fall tillage to break up root stubble and expose borers to natural enemies and winter hardships.
3. On hardland, deep and clean plowing of corn stubble to a depth of 5 or more inches will bury larvae and/or pupae, and prevent a high percentage of moth emergence the following spring.
4. Avoid late-planted corn, particularly extremely late-planted. Such fields are sometimes heavily infested with second generation borers and harvesting before girdling begins may be harder to achieve, unless silage corn can be utilized.

Spider Mite

At least 3 species of mites have been identified from corn: the banks grass mite, the two-spotted mite, and the carmine mite. Each may react differently to control measures.

Mites are primarily a problem in western Kansas. Fields should be kept under close observation during June, July, and August to detect beginning infestations. Speed of mite buildup and maturity of plants will dictate the need for treatment.

Simulated mite damage studies indicate that leaf loss is important primarily from the tasseling through soft dough stages.

Producers should follow the progression of mite infestations and damage on at least a weekly basis. Some damage to the plant can be tolerated. The complete loss of the bottom 2 to 3 leaves has not affected yields. Small colonies of mites on several or most of the leaves is not at that point necessarily damaging if there is a minimum of visible yellowing.

Mite control should be initiated when observations reveal that the majority of the plants are infested with mites severe enough to cause some yellowing and browning of the lower leaves, but before damage has become serious enough to kill more than the bottom one third of the leaves where plant growth is in the tasseling through dough stages. No reduction in yield has been observed where all the leaves were removed at full dent stage, a strong indication that mite infestation at this point is no longer a factor of production.

Observations also indicate that water stress appears to influence the rate of mite increase. The importance of proper water management cannot be overstressed.

Recent observations indicate that presence of predaceous insects and mites may be an important part of the natural defense system. The use of more of an integrated type of mite control program may be indicated in the future.

Sprays:

Influence of proper gallonage is very important. As the amount of foliage increases, gallonage should likewise increase. Three gallons of spray per acre should be considered a minimum for waist-high corn. Up to 5 gallons per acre is needed when all leaves are fully expanded. Consistent results have not been obtained with any of the recommended materials. Where mites are increasing rapidly at least two applications applied 7 to 10 days apart may be needed. Pay particular attention to the waiting intervals and number of applications permitted.

Oxydemetonmethyl

⅓ pound actual per acre. Do not apply within 7 days of harvest of corn or 7 days of harvest of corn fodder.

Carbophenothion

1 pound actual per acre. Do not use within 21 days of harvest or cutting.

Disulfoton (Di-Syston LC)

⅔ to 1⅓ pint of 6-pound L.C. per acre. Do not apply within 28 days of harvest. Do not apply more than one soil and one foliar treatment per season.

Ethion

1 pound actual per acre. Do not apply more than once after ears form and do not feed treated forage to livestock. Wait 50 days before grain harvest.

Dimethoate

⅓ pound actual per acre. Not more than 3 applications per year. Do not apply within 14 days of foraging or within 42 days of grain harvest.

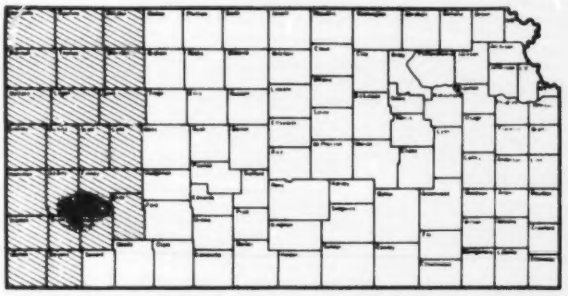
Stalk Borer

Damage occurs in May and June. Attacks plants along field margins or in weedy fields. Spraying the weedy margins in fields where stalk borers have caused problems will reduce injury by using one of the insecticides listed for grasshopper control.

Western Bean Cutworm

The map summarizes distribution of this insect's activity prior to 1974, which was greatest in northwest Kansas. During the last two years, however, intensity has generally decreased there and increased south of the Arkansas River, covering parts of four counties. Adult moths have been collected in traps near Hays, Great Bend, Scandia and Hiawatha, but thus far larvae have not been collected from the fields in these areas.

Distribution of Field Infestation of Western Bean Cutworm (1976)



Dark area indicates greatest intensity of infestation in 1976. Official records have not been obtained from Hamilton county, though informal reports suggest that it is established there.

Very careful scouting and timing is necessary to obtain adequate control. Begin checking fields as they begin to tassel and continue until silks turn brown. Look for egg masses on upper surface of leaves and also look for small worms with very faint brownish stripes in tassels. Control measures are indicated if an average of 14 plants with eggs or larvae in each 100 plants checked is found when corn is 95 percent tasseled. The critical period usually occurs between July 18 and 30 in southwestern Kansas and about a week later in the northwest.

Carbaryl

2 pounds actual per acre (Sevin 4 oil—apply 2 qts. plus 2 qts. diesel fuel, kerosene or #2 fuel oil per acre) or Sevinmol at 2 qts., plus at least one gallon of water per acre and preferably two gallons of water per acre.

Note: Use of Carbaryl on corn in Western Kansas may help promote mite infestations. We suggest use of this product only where economic infestations of western bean cutworm are known to exist. Consult extension entomologists for suggestions on possible use of alternatives.

Sorghum Insect Control

Chinch Bug

Damage occurs in May through June. Immature bugs migrate from small grains to sorghums. Bugs congregate near the base of plants. Check fields closely when plants are small. Apply as a barrier 2 to 4 yards wide between small grain and sorghum fields. Use drop nozzles and direct spray to base of plants. Use 20 gallons of water per acre.

Barrier treatment:

*Endrin**

½ pound actual per acre. Do not use on field crops.

Field infestation:

Carbaryl

As used for control of infestations in sorghum fields in recent years is not listed on labels of locally available formulations.

Toxaphene

2 pounds actual per acre. 28 days waiting interval. Do not graze dairy animals or beef animals being finished for slaughter. Do not ensile treated forage.

Corn Earworm

Green to brown worms with light brown head capsule. Apply control measures when there is an average of two or more small worms per head. Varieties with open-type heads are less susceptible to earworm infestations.

Carbaryl

2 pounds actual per acre. Do not use within 21 days of harvest for grain. No preharvest waiting interval is required for forage use.

Ethyl Parathion

¾ pound actual per acre. Do not use within 12 days of harvest.

Mevinphos

½ pound actual per acre. Do not use within 3 days of harvest.

Corn Leaf Aphid

Damage occurs in July through frost. Green aphids with dark heads. Infestation may occur any time during the growing season. Control rarely profitable when infestation is in the whorl stage. Control may be profitable if infestation continues on heads after they emerge when yield prospects are good.

*Use pattern under review by ERA. Producers should check legal status of endrin during 1977.

Ethyl Parathion

½ pound actual per acre. Do not use within 12 days of harvest.

Malathion

1 pound actual per acre. Do not use within 7 days of harvest.

Disulfoton (Di-Syston LC)

¼ to ½ pound per acre. A maximum of three foliar sprays may be made at rates of ½ pound (⅔ pt.) or less. Harvest restrictions are as follows: Any soil application plus any foliar application wait 34 days for grain or forage; where three foliar applications are made waiting interval is same as above; where less than three foliar applications are made wait 7 days for grain and 28 days for forage use.

Fall Armyworm

Damage occurs in July through frost. Dark body with faint stripes. Dark head with inverted Y on face. May attack the whorl; later in the heads. Control in the whorl stage is generally unprofitable.

Carbaryl

2 pounds actual per acre. Do not use within 21 days of harvest for grain. No preharvest waiting interval is required for forage use.

Ethyl Parathion

¾ pound actual per acre. Do not use within 12 days of harvest.

Mevinphos

½ pound actual per acre. Do not use within 3 days of harvest.

False Wireworm

Damage occurs at planting time. Yellow hard-shelled larvae in soil. Attacks seed before germination. Controlled by use of one of the seed treatment materials. These materials may be used alone or in combination with a fungicide. Use according to label instructions. Leftover seed must not be fed to livestock.

Heptachlor or Lindane

Kafir Ant or Thief Ant

Damage occurs at planting time. Small yellowish red ants attack seed before germination and may be easily overlooked.

Use one of the seed treatment materials listed above.

Seed Corn Beetle

Beetles eat seed before germination.

Use one of the seed treatment materials listed above.

Sorghum Greenbug

Infestations occur annually in Kansas although damage varies from year to year. Injury may be caused anytime during the growing season from seedling through soft dough stages. Infestations may consist of either winged or wingless adults, plus their progeny (nymphs). Greenbugs are light yellowish-green aphids that concentrate primarily on the undersides of lower leaves. They have a tremendous reproductive capacity; adult females give birth to living young which reach maturity in 5 to 7 days. All adults are females and they produce progeny at the rate of about 2 per day over a 10- to 15-day period in warm weather. Greenbugs possess a toxic substance that makes them more damaging than other species of aphids.

Resistant Varieties

If possible, plant resistant varieties of sorghum. Resistant varieties will continue to serve as hosts to greenbugs, but can tolerate heavier populations before damage occurs. Under very heavy infestations, control may still be necessary. Use of these varieties should greatly reduce the overall need for chemical treatment. Use of these varieties may be especially desirable in those areas of western Kansas where control problems with some insecticides have been encountered. Greenbug resistance adds another factor to be considered in the selection of sorghum varieties, but its importance must be kept in perspective to the importance of the other factors of variety selection.

Susceptible Varieties

Determining the Need for Control Measures

Refer to the control guide below. Early in the season where plant height averages up to 3 inches, infestations are considered threatening when they average 10 or more greenbugs per plant. Control measures should be applied without delay where greenbugs average 25 or more per plant.

To determine the average number of greenbugs per plant, the total number of greenbugs must be counted on a number of plants selected at random from different areas of the field. Where plant height is less than 6 inches, not less than 20 plants should be counted. The number of greenbugs found on each plant should be recorded and the total for 20 plants divided by 20 to obtain the per plant average. Where plants are larger than 6 inches in height, a total of 10 plants may suffice if care is used in obtaining a representative sample. Sorghums should certainly be inspected on a weekly basis and at 3-4 day intervals where infestations are rapidly increasing.

The term "threatening" is used to indicate a situation that is not damaging at the present time, but which, unless checked by natural forces, will probably be at or above the recommended treatment level within the coming week.

The table below provides a control guide based on various stages of growth. From late whorl stage through the milk stage, a field is threatened at a population of 700 greenbugs per plant and should be controlled where infestations average 1000 per plant. Infestations must be "estimated" at levels of above about 100 per plant. Experience has shown that an infested leaf will average about 250 greenbugs per square inch in the areas where the greenbugs are crowded closely together. A plant with three leaves infested, each of which has colonies of greenbugs uniformly covering one square inch will result in a total per-plant average of about 750 greenbugs. If observations on 10 to 20 plants in a field resulted in a per-plant average of 750, the field would be at the threatened level in the boot stage, but would be at treatment level if plant height was 12-15 inches.

Also keep natural forces in mind. Heavy rains can eliminate infestations at the seedling stage and parasitic wasps are usually important in midsummer. Greenbugs that have been parasitized turn into brown or bronze mummies and cling to the leaves. If a field that has reached the threatening infestation level also has an average of 10-12 mummies per plant, it would indicate that control **generally should be delayed** because parasitic wasps will soon bring the greenbug infestation under control. During some years, this does not work as expected and in that case the field in the above situation should be rechecked at 3-4 day intervals. If after one week the infestation is still at or above the recommended treatment level, and if the number of mummies has not changed greatly, immediate control would be advisable. On the other hand, if the rate of increase in greenbug numbers appears to have stabilized or decreased slightly, control should be further delayed on the assumption that the peak of the infestation has passed.

Greenbug Control Guide
(Susceptible Varieties)

Plant Height	Avg. No. Live Leaves	Threatening	At Treatment Level
0-3"	0-4	10+	25
3-5"	3-6	25+	50-150
5-12"	5-8	50+	150-300
12-15"	8-10	300+	300-700
15-22"	10-12	500+	700-800
final leaf visible	10-12	700+	1000
boot	10-12	700+	1000
half bloom	10-12	700+	1000
soft dough			

Resistance to Insecticides

Failures with DiSyston and dimethoate were noted in the Texas Panhandle region since 1974. Control problems have also been observed in various car areas of southwest Kansas. Laboratory studies of samples collected in Garden City confirmed the presence of a high degree of resistance to DiSyston and a light to moderate level of resistance to dimethoate. Studies in eastern Kansas did not show any significant change in response to recommended insecticides.

No major changes in chemical control recommendaions can be formulated at this time. Indications are that ethyl parathion generally continued to give satisfactory control where other compounds failed and there is some evidence that mixtures of parathion and Cygon or DiSyston and Cygon may control resistant populations better than either material applied separately, but there has not been enough testing to warrant recommendations of specific mixtures. Oxydemetonmethyl recently labeled for this used appears promising in this area.

Systemic treatments for planting time or early post plant application. (Susceptible varieties)

Planting Time Application (This recommendation is intended, primarily, for eastern Kansas where serious, early season infestations have developed in recent years.)

For protection of stands against early season greenbug infestations, use disulfoton, phorate, or carbofuran as a planting time application at the rate of 1 pound actual per acre based on 40-inch rows. Apply granules in a 4- to 6-inch band applied in front of the press wheel. Initial systemic action may be delayed in emerging plants until roots are established. Carbofuran may be used as a band or applied directly into the seed furrow.

Good control has been achieved where infestations on larger plants have occurred relatively early in the growing season, but control may not be as effective where infestations develop later than 6 weeks after planting. Disulfoton has given the longest protection in most tests, but all compounds perform about equally during the first 4 weeks under moist soil conditions.

Warning: Stand reductions have occurred where disulfoton or phorate has been used in separate applications on sandy and silt loam soils with all the preemergent herbicides currently used on sorghum. At this time we cannot predict the environmental conditions that cause these adverse interactions.

Note additional restrictions below:

Granules applied over-the-row—Disulfoton or phorate may be applied over-the-row in a band at ½ to 1 pound actual per acre or as a broadcast application at 1 pound actual per acre. This method appears more promising than sprays in controlling infestations on seedling plants where severe reinfestation pressure is occurring.

Sprays—Sprays applied for the control of seedling infestations may be used if other alternatives are not available. The success is related to the size of the small plants and the severity of infestations in the community.

Restrictions—Do not place disulfoton or phorate in the vicinity of the seed. Do not apply disulfoton granules more than three times per crop season, nor use within 30 days of grain or 14 days of forage use. Do not use phorate within 28 days of harvest. Apply only granular formulations. Liquid formulations of disulfoton are not recommended for use as a planting soil application in Kansas. Granules may perform better and may be less likely to injure seedlings.

Use carbofuran only on grain sorghum or sorghum for forage.

Foliar Sprays—For early or midsummer infestations (Intended for use primarily on susceptible varieties or where usually heavy infestation develops on resistant varieties).

Di-Syston LC (may not give control in Southwest Kansas)

¼ to ½ pound per acre. A maximum of 3 foliar sprays may be made at rates of ½ pound (⅔ pt.) or less. Harvest restrictions are as follows: Any soil application plus any foliar application wait 34 days for grain or forage; where 3 foliar applications are made waiting interval is same as above; where less than 3 foliar applications are made wait 7 days for grain and 28 days for forage use.

Ethyl Parathion

¼ to ½ pound actual per acre. Do not use within 12 days of harvest.

Demeton

¼ pound actual per acre. Do not use within 35 days of harvest. Do not apply more than once per season.

Dimethoate (may not give control in Southwest Kansas)

½ pound actual per acre. Do not apply within 28 days of last application.

Oxydemetonmethyl

¼ pound actual per acre. Do not apply more than three times per season nor within 45 days of grain harvest or 21 days for forage use.

Malathion

1 pound actual per acre. Do not use within 7 days of harvest. Waiting intervals apply either to harvest for grain or cutting for forage.

Sorghum Webworm

Damage occurs in August through September. Outbreaks are usually confined to southeast Kansas. They are small fuzzy worms which feed inside the head. Keep

Johnsongrass mowed and plant early to avoid buildup. Outbreaks often occur in September. Infestation does not injure mature seed.

Toxaphene

3 pounds actual per acre. Do not apply within 40 days of harvest with this rate of toxaphene. Do not apply more than once. Do not graze dairy animals or animals being finished for slaughter. Do not ensile treated forage.

Mevinphos

½ pound actual per acre. Do not use within 3 days of harvest.

Ethyl Parathion

¾ pound actual per acre. Do not use within 12 days of harvest.

Wireworm

Destroys seed or small plants. Seed treatment will aid in control of light populations.

Wheat Insect Control

Army Cutworm

Damage occurs in March, April, and May in western half of Kansas. Brown larvae chew plants off at ground, feed above ground. Apply control measures on warm days when there are 4 to 5 worms per square foot.

Endrin

1/10 to 1/5 pound actual per acre. 45 day waiting interval. Do not feed endrin-treated forage. Use one application only.

Endosulfan

½ pound actual per acre. Do not graze treated forage to dairy animals or beef animals being finished for slaughter. Do not apply after heads begin to form.

Toxaphene

2 pounds actual per acre. Do not graze treated forage to dairy animals or beef animals being finished for slaughter. No restrictions on use of grain.

Armyworm

Damage occurs in May through early June. Greenish color with a pattern of stripes. Devours foliage. Clips beards and heads of lodged plants.

Toxaphene

2 pounds actual per acre. No waiting interval between application and harvest. Do not feed treated forage to dairy animals or beef animals being finished for slaughter.

Parathion

½ pound actual per acre. Do not use within 15 days of harvest.

Trichlorfon

¾ to 1 pound actual per acre. Do not apply within 21 days of harvest. No restrictions on grazing.

Banks Grass Mite

Damage occurs in fall or spring. Tiny colorless mite may destroy wheat adjoining volunteer wheat or sorghum fields. Leaves are webbed.

Parathion

¾ to 1 pound actual per acre. Do not use within 15 days of harvest.

Dimethoate

⅓ pound actual per acre. 14 day interval for grazing; 60 days before harvest.

Brown Wheat Mite

Tiny brown mite. Leaves dry out. Fine mottling or bronzing of leaves. Often associated with drought. Populations disappear in mid-April. Control must be conducted earlier for yield results. Control rarely profitable.

Parathion

½ pound actual per acre. Do not use within 15 days of harvest.

Dimethoate

⅓ pound actual per acre. 14 day interval for grazing; 60 days before harvest.

Crown Aphid

Infestation occurs in fall. Orange and dark olive green aphids are found on crown and roots of wheat. Often found during the fall months but cause no evident injury.

Chemical control not justified.

English Grain Aphid

Infestation occurs in fall and March through June. Bright green; cornicles and legs black. Feeds on leaves in

the fall; colonies found on heads in the spring. Causes no evident injury.

Chemical control not justified.

Fall Armyworm

Infestations sometimes occur in the fall and may destroy top growth.

Toxaphene

2 pounds actual per acre. Do not graze treated fields nor feed treated forage to dairy animals or beef animals being finished for slaughter.

Parathion

¼ pound actual per acre. 15 day waiting interval between use as pasture or harvest.

Trichlorfon

¼ to 1 pound actual per acre. Do not apply within 21 days of harvest. No restrictions on grazing.

False Wireworm

Damage occurs in fall. Yellow, hard-shelled larvae are in soil. They attack seed before germination. Use insecticides alone or in combination with fungicides at the rate recommended on the label. Do not feed treated seed to livestock.

Lindane or Heptachlor

Flea Beetle

Damage occurs in fall. Tiny, shiny jumping beetles strip off upper surface of leaves near grassy fence rows.

Malathion

¼ to 1 pound actual per acre. 7 day waiting interval.

Toxaphene

1⅓ pounds actual per acre. Do not graze treated fields nor feed treated forage to dairy animals or beef animals being finished for slaughter.

Grasshopper

Damage occurs in fall and spring. Infests field margins of fall-sown wheat as it emerges, and may chew off heads before harvest. Check wasteland margins at least 10 days before planting to determine grasshopper abundance.

Malathion

¼ to 1 pound actual per acre. 7 day waiting interval.

Toxaphene

1⅓ pounds actual per acre. Do not graze or feed treated forage to dairy animals or beef animals being finished for slaughter.

Phorate Granular

1 pound actual per acre based on 8-inch drill row spacing. Use a grass seeder attachment or a granular or fertilizer applicator properly calibrated. Do not mix granules directly with the seed. Apply as a border treatment for 30 to 40 feet around the outside margins of the field. Do not graze foliage within 45 days of treatment.

Greenbug

Damage occurs in the fall or in March, April and May. Green line down the back of adult specimens. Black tips of legs and cornicles. Kills small plants, reduces tillering. Control when bugs number 100 per foot of row on plants up to 6 inches tall. Spray only when the temperature is 65° F. or above.

Methyl Parathion

¼ pound actual per acre. 15 day waiting interval.

Malathion

¼ to 1 pound actual per acre. 7 day waiting interval.

Parathion

¼ pound actual per acre. 15 day waiting interval.

Di-Syston LC

⅓ pound actual per acre. Do not graze treated forage. A second application may be made within 30 days. Do not apply within 30 days of grain harvest.

Demeton (Systox)

¼ pound actual per acre. Do not harvest within 45 days. Do not graze treated fields. Do not apply more than twice per season.

Dimethoate

⅓ pound actual per acre. Do not apply within 14 days of grazing nor within 60 days of grain harvest.

Hessian Fly

Damage occurs in fall and spring. Short, broad center leaf of small plants; larvae and pupae (flaxseeds) at the base of tillers or above nodes of mature straw. Fall infestations destroy tillers, and spring damage consists of broken straws above nodes with flaxseed at point of break.

Destory volunteer wheat.

Plant after flyfree date.

Parker and Kirwin have good resistance throughout the state. Buckskin and Gage have lower resistance, but usually give satisfactory protection. Scout, Eagle, Sage,

and Cloud have some tolerance to the Hessian fly, but cannot be relied on to give adequate protection.

Larned variety has Hessian fly resistance.

Pale Western Cutworm

Damage occurs in spring. Limited to extreme western counties in certain years. White cutworm without conspicuous markings. Feeds underground. Light harrowing after application may improve control. Apply control measures where populations average two or more worms per square foot.

*Endrin**

1/5 pound. 45 day waiting interval. Do not feed endrin treated forage. Use one application only.

Wheathead Armyworm

Damage occurs in May through June. Body tapers toward the rear. Destroys green heads.

Toxaphene

2 pounds. Do not feed treated forage to dairy animals or beef animals being finished for slaughter.

Trichlorfon

1 pound actual. Do not apply within 21 days of harvest.

Wheat Curl Mite

Wheat streak mosaic, a virus disease, is transmitted by the wheat curl mite.

Symptoms: rolled leaves; trapped beards of head; mites are invisible. Leaves show symptoms of streak mosaic. For more complete information, see bulletin MF-30, "Preventing Disease in Wheat" or "The Wheat Curl Mite in Relation to Epidemiology and Control of Wheat Streak Mosaic," Kansas Agricultural Experiment Station Research Publication 162, October 1970.

Delay planting as long as practical.

Tolerant varieties: Triumph, Triumph 64, and Eagle are moderately tolerant to wheat streat mosaic. Sage, Cloud, Scout, and Trison may give a small amount of protection. None of the commonly grown varieties is resistant to the wheat curl mite.

Wheat Stem Maggot

Damage occurs in May through June. Damage causes conspicuous white heads above the green flag leaf when field is still green.

No chemical control.

Delay planting until after flyfree date.

White Grub

Damage occurs in fall and spring. Rarely of much importance. Grubs in the soil feed on roots or cut off plants above roots. Damage may be expected when 4 to 5 grubs are found per square foot. Grubs may be seen when preparing field for seeding. No chemicals currently around for this problem.

Soybean Insect Control

Bean Leaf Beetle, Mexican Bean Beetle

The bean leaf beetle is present in all parts of the state, but the Mexican bean beetle occurs only in a few northeastern counties and rarely attacks soybeans. Bean leaf beetles chew oval holes in foliage. Control rarely is needed. Mexican bean beetle skeletonizes leaves and attacks pods.

Carbaryl

1 pound actual per acre. No waiting interval.

Toxaphene

1½ pounds actual per acre. 21 day waiting interval. Do not feed treated plants to dairy, poultry, or animals being finished for slaughter.

*Endrin label under review by EPA. Producers should legal status before using in 1977.

Azinphosmethyl

8 ounces actual per acre. 45 day waiting interval.

Corn Earworm

Damage occurs from August through September. Infestations in Kansas have been confined to the southeastern part of the state. Damage occurs when larvae feed on pods. Check fields during and after bloom for eggs and small worms. Dust formulations may give better penetration of foliage. Apply control measures when scouting shows an average of 30 small worms per 30 feet of row.

Carbaryl

1½ pounds actual per acre. No waiting interval.

Methyl Parathion

1 pound actual per acre. Do not use within 20 days of harvest.

Flea Beetle

May attack seedlings or older plants. Chews pinholes in leaves.

Toxaphene

2 pounds actual per acre. Do not use within 21 days of harvest. Do not feed treated plants to dairy, poultry, or animals being finished for slaughter.

Garden Webworm

Damage occurs in July through August. Slender green worms web leaves.

Toxaphene

2 pounds actual per acre. 21 day waiting interval. Do not feed treated plants to dairy, poultry, or animals being finished for slaughter.

Grasshopper

Damage occurs in June through September. Buildup occurs in field margins. Check margins and treat those areas before migration starts. Observe precautions if soybean foliage is treated.

Toxaphene

1 pound actual per acre. 21 day waiting interval. Do not feed treated foliage to dairy, poultry, or beef animals being finished for slaughter.

Carbaryl

¾ pound actual per acre. No waiting interval.

Green Cloverworm

Damage occurs in July through September. Pale green-colored looper worm with two white stripes down each side. Feeds on foliage. Control when there are 12 to 20 worms per linear foot of row.

Carbaryl

1½ pounds actual per acre. No waiting interval.

Toxaphene

1½ pounds actual per acre. 21 day waiting interval. Do not feed treated foliage to dairy, poultry, or animals being finished for slaughter.

Azinphosmethyl

8 ounces actual per acre. 45 day waiting interval.

Seed Corn Beetle, Seed Corn Maggot

Soil infesting insects that attack the seed before germination. Control them by use of one of the following materials as a seed treatment. Follow label directions for use. Do not feed leftover treated seed to livestock.

Heptachlor or Lindane

Stink Bug

Damage occurs when pods are being formed. Limited to southeast Kansas. Apply control when you find 10 bugs per 30 feet of row. Spot treat where infestations are localized.

Carbaryl

1 pound actual per acre. No waiting interval.

Malathion

1 pound actual per acre. 1 day waiting interval.

Methyl Parathion

½ pound actual per acre. 20 day waiting interval.

Azinphosmethyl

8 ounces actual per acre. 45 day waiting interval.

List of Poison Control Centers Now in Operation in Kansas

City	Name and address	Telephone	Director and Assistant Director
Atchison	Atchison Hospital 1301 N. 2nd St. 66002	367-2131	Ira R. Morrison, M.D. James Asher, Adm.
Dodge City	Trinity Hospital 1107 6th St. 67801	227-8133	R. Dale Boles, M.D. Mary Crotinger, RN
Emporia	Newman Memorial Hospital 12th & Chestnut Sts. 66801	342-7120 Ext 330	David Davis, M.D. Carolyn Darby, RN Sandra Koch, RN
Fort Riley	Irwin Army Hospital 66442	239-2323	John O'Laughlin, M.D.
Fort Scott	Mercy Hospital 821 Burke St. 66701	223-2200 day 223-0476 night	A.C. Irby, M.D. Gary F. Crabtree John C. Hegood, RPH
Great Bend	Central Kans. Medical Center 3515 Broadway 67530	793-3523 day 792-2511 night	D.G. Shivel, M.D. Barbara Davenport, RN
Hays	Hadley Regional Med. Center 201 E. 7th St. 67601	628-8251	J.J. Cody, M.D. R.N. Neil, M.D.
Kansas City	Univ. of Kansas Med. Center 39th & Rainbow Blvd. 66103	831-6633	William Sosnow, M.D. John Doull, M.D.
Kansas City	Bethany Medical Center 51 No. 12th St. 66102	287-8881	Chas. Hammontree Roxanne Marquess, RN
Lawrence	Lawrence Memorial Hospital 325 Maine Street 66044	843-3680	V.L. Branson, M.D.
Parsons	Labette Co. Medical Center South 21st St. 67357	421-4880	John P. White, M.D.
Salina	St. John's Hospital 139 N. Penn St. 67401	827-5591 Ext 112	Wm. G. Null, M.D. Ruth Berquist, RN
Topeka	Stormont-Vail Hospital 10th & Washburn Sts. 66606	234-9961 Ext 150	B.W. Ramsey, M.D. D. Landis, RN
Wichita	Wesley Medical Center 550 N. Hillside Ave. 67214	685-2151 Ext 7515	Daniel J. Caliendo, M.D.
	Kansas Poison Control Information Center		
Topeka	Kansas Department of Health Food and Drug Division	296-3708	Evan Wright

A number of labels of chemicals recommended in this publication may be subject to change during the calendar year. Any changes that affect these recommendations will be announced in the KANSAS INSECT NEWSLETTER. To be included in the mailing list of this publication return this notice to:

Extension Entomology
128 Waters Hall
Kansas State University
Manhattan, Kansas 66506

COOPERATIVE EXTENSION SERVICE, KANSAS STATE UNIVERSITY, MANHATTAN

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